Seeing is Believing

When Nutrition Saves Sight

VISION

While 20/20 vision has become a symbol of visual clarity, between now and the year 2020, more and more people will experience vision loss, according to the National Eye Institute (NEI), based in Bethesda, Maryland. That's due largely to the aging of the U.S. population.

In the next 10 years, millions of U.S. residents aged 40 and older are projected to experience some measure of vision loss due to age-related macular degeneration (AMD), glaucoma, cataract, and/or diabetes-related vision damage. The macula is a 3-millimeter-wide yellow spot near the center of the retina responsible for the central field of vision.

Significantly, Agricultural Research Service-funded researchers at the Laboratory for Nutrition and Vision Research are finding that healthy eating can reduce health care costs and the incidence of quality-of-life declines from these diseases. The laboratory, directed by Allen Taylor, is part of the Jean Mayer USDA Human Nutrition Research Center on Aging (HNRCA) at Tufts University in Boston, Massachusetts.

For one study, the researchers analyzed dietary intake and other data from 4,003 men and women, aged 55 to 80, who had participated in the long-term, NEI-funded Age-Related Eye Disease Study, or AREDS. Led by Chung-Jung Chiu, the researchers ranked intake of each of several nutrients consumed during the AREDS study, then calculated a compound score to gauge their combined dietary effect with links to risk of AMD. The scoring system allowed them to evaluate associations between individual—and combined—dietary nutrients. They also studied specific food-intake patterns and risk of AMD.

The study indicated that regularly consuming a combination of the protective nutrients and a low glycemic index diet provided an AMD-protective effect.

A food's glycemic index is an indicator of how fast the carbohydrate it contains will spike blood sugar levels. The nutrients that were found to be most protective in combination were vitamins C and E, zinc, lutein, zeaxanthin, and the omega-3 fatty acids known as "DHA" and "EPA."

As the eye ages, oxidized proteins—debris called "drusen"—begin to accumulate in the macula. A key indicator of AMD risk was finding measurable drusen deposits during a routine examination of the macula, conducted by an eye doctor. "Because drusen tend to increase in number and size over time, finding drusen at an early stage was significant," says Chiu.

The study was published in *Ophthalmology* in May 2009.

HNRCA researchers are also conducting human cell culture studies to better understand mechanisms behind nutrition-vision links. One study, led by Elizabeth Whitcomb, unearthed a new way that eye cell division and proliferation are controlled. When damaged proteins gather within the eye's lens, cloudiness occurs. That protein buildup could lead to cataract. Ubiquitin enzymes are involved in removal of these degraded proteins.

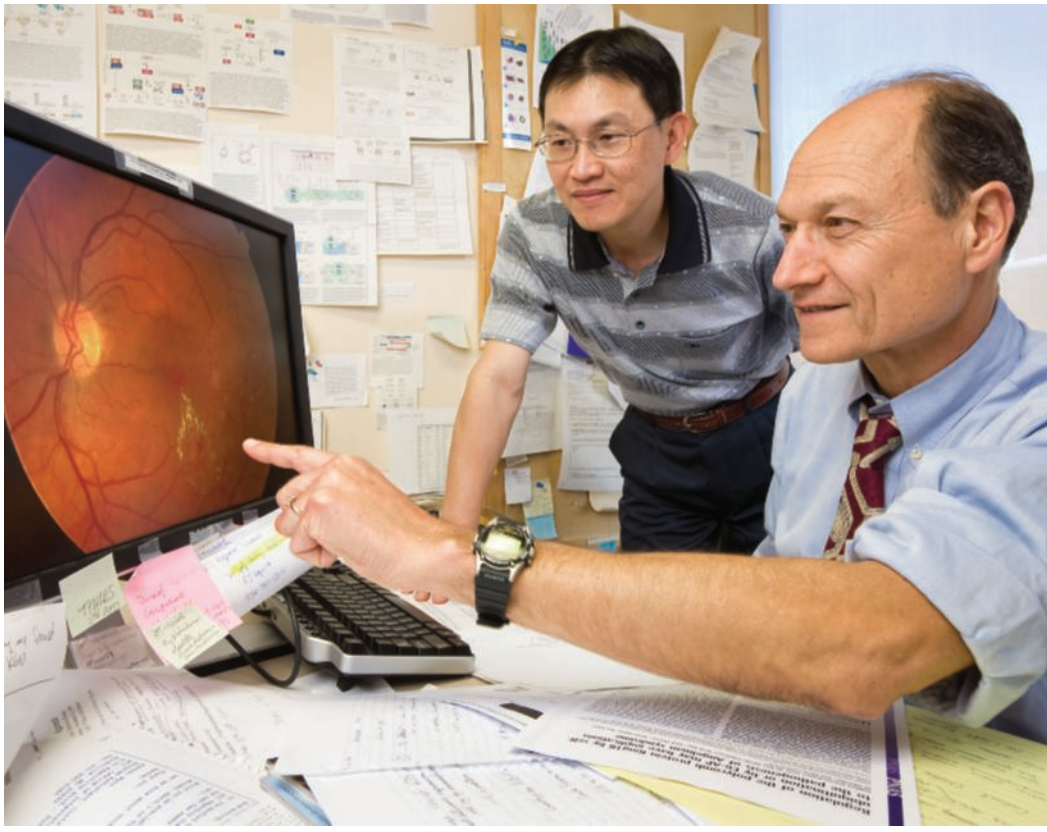
The researchers found that when ubiquitin-conjugating enzyme H7 was artificially decreased in cells, the cell phase during which DNA is synthesized prior to division, called "S phase," took longer. This resulted in less cell proliferation.

The study appears in *Molecular Biology of the Cell* in 2009.—By **Rosalie Marion Bliss,** ARS.

This research is part of Human Nutrition, an ARS national program (#107) described at www.nps.ars.usda.gov.

Allen Taylor is with the Laboratory for Nutrition and Vision Research, Jean Mayer USDA Human Nutrition Research Center on Aging at Tufts University, 711 Washington St., Boston, MA 02111-1524; (617) 556-3156, allen.taylor@tufts.edu.

STEPHEN AUSMUS (D1817-1)



Epidemiologist Chung-Jung Chiu (left) and biochemist Allen Taylor review an image of the retina of a patient with macular degeneration, seen as the yellow spotting in the macula (the darker area in the center of the retina).